

REPORT DOCUMENTATION PAGE

AFRL-SR-BL-TR-00-

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the gathering and maintaining the data needed, and completing and reviewing the collection of information. Send your collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188).

0657

yes,
this
son

1. AGENCY USE ONLY (Leave Blank)		2. REPORT DATE 9/1/00		3. REPORT TYPE AND DATES COVERED Final, 7/1/97-9/30/99	
4. TITLE AND SUBTITLE Flexible Software Composition CHAIMS				5. FUNDING NUMBERS F49620-97-1-0344	
6. AUTHORS Gio Wiederhold and Neal Sample					
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Office of Sponsored Research Stanford University Stanford, Ca 94305				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) AFOSR/NM 110 Duncan Ave, Room B115 Bolling AFB DC 20332				10. SPONSORING / MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES					
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approval for public release; distribution unlimited				12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) The CHAIMS effort is developing and refining a very high level programming language for software module composition. In the last two years, that language has been codified and is known as CLAM, the Composition Language for Autonomous Megamodules. The language is currently supported by the CPAM (CHAIMS Protocols for Autonomous Megamodules) runtime system. CPAM is the interface between the compiled megaprogram (client) and the megamodules (servers).					
14. SUBJECT TERMS Software Composition, Megaprogramming				15. NUMBER OF PAGES 2	
				16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL		

20001208 054

The CHAIMS effort is developing and refining a very high level programming language for software module composition. In the last two years, that language has been codified and is known as CLAM, the Composition Language for Autonomous Megamodules. The language is currently supported by the CPAM (CHAIMS Protocols for Autonomous Megamodules) runtime system. CPAM is the interface between the compiled megaprogram (client) and the megamodules (servers).

The CHAIMS compiler generates a variety of invocation sequences for current and developing standards for software interoperation, with a focus on multi-computer, distributed operation. The language includes the ability to set up module interfaces prior to executions, request performance estimates from modules prior to their invocation, schedule modules in parallel, monitor execution of invoked modules, interrupt inadequately performing modules, and provide data and meta-information to customer interface modules.

CHAIMS supports a paradigm shift that is already occurring: a move from coding as the focus of programming to a focus on composition. This shift is occurring invisibly to many enterprises, since there is no clear boundary in moving from subroutine usage to remote service invocation. There are hence few other tools and inadequate education to deal with this change.

CHAIMS Literature:

Sample, Beringer, Wiederhold: A Comprehensive Model for Arbitrary Result Extraction; awaiting publication

Wiederhold, Beringer, Sample, Melloul: Composition of Multi-site Services; accepted for IDPT'99, Kusadasi, Turkey, June 1999 (conference was moved to IDPT 2000, Dallas, USA)

Beringer, Wiederhold, Melloul: A Reuse and Composition Protocol for Services; SSR'99, colocated with ICSE'99, Los Angeles, May 1999

Melloul, Beringer, Sample, Wiederhold: CPAM, a Protocol for Software Composition: CAiSE'99, Heidelberg, Germany, June 1999; Springer LNCS volume 1626

Sample, Beringer, Melloul, Wiederhold: CLAM: Composition Language for Autonomous Megamodules; Third Int'l Conference on Coordination Models and Languages, COORD'99, Amsterdam, April 26-28, 1999

Beringer, Wiederhold: Cost Estimation in CPAM, an Access Protocol for Remote and Autonomous Services, Position Paper for the Workshop on Cross-Organisational Workflow Management and Co-ordination, WACC'99, San Francisco, Feb. 22, 1999, available at

<http://SunSITE.Informatik.RWTH-Aachen.DE/Publications/CEUR-WS/Vol-17/>

Chavez, Tornabene, Wiederhold: Software Component Licensing: A Primer, IEEE Software, Vol 15 No 5, 1998

Beringer, Tornabene, Jain, Wiederhold: A Language and System for Composing Autonomous, Heterogeneous and Distributed Megamodules; DEXA International Workshop on Large-Scale Software Composition, Vienna Austria, August 28, 1998

Tornabene, Jain, Wiederhold: Software for Composition: CHAIMS; position paper for the Workshop on Compositional Software Architectures of OMG, DARPA and MCC in Monterey, CA, January 6-8, 1998

Perrochon, Wiederhold, Burbach: A Compiler for Composition: CHAIMS; Fifth International Symposium on Assessment of Software Tools and Technologies (SAST'97), Pittsburgh, June 3-5, 1997

Wiederhold, Wegner, Ceri: Towards Megaprogramming; CACM, Nov.1992